

AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough; and 2. added matter is shown by underlining.

1-29. (Cancelled).

Please add new claims 30-62 as follows:

30. (New) A method of material processing with laser pulses having a large spectral bandwidth, wherein the laser pulses impinge on or enter into an object to be processed and cause a physical or chemical change in material of the object to be processed, the method comprising:  
selectively modifying one or more spectral parameters of the laser pulses before or during the processing process to achieve defined processing-specific effects.

31. (New) The method of Claim 30, wherein the defined processing-specific effects are selected from the group consisting of:

an increase in processing speed, an improvement in material selectivity, an improvement in surface structuring, an achievement of an optical breakthrough, and any combination thereof.

32. (New) The method of Claim 30, wherein the modified spectral parameter is a spectral amplitude of the laser pulses.

33. (New) The method of Claim 30, wherein the modified spectral parameter is a spectral phase of the laser pulses.

34. (New) The method of Claim 30, wherein the modified spectral parameter is a spectral polarization of the laser pulses.

35. (New) The method of Claim 30, further comprising dynamically modifying at least one spectral parameter as a function of a measurable quantity of the process.

36. (New) The method of Claim 35, wherein a removal rate of material processing serves as the measurable quantity.

37. (New) The method of Claim 35, wherein a surface roughness serves as the measurable quantity.

38. (New) The method of Claim 35, further comprising using a transmission of the object to be processed as the measurable quantity producing or processing an optical wave guide.

39. (New) The method of Claim 35, further comprising using a reflection of electromagnetic waves as the measurable quantity for producing or processing an optical wave guide.

40. (New) The method of Claim 35, wherein a fraction of laser light reflected by a processing zone serves as the measurable quantity.

41. (New) The method of Claim 35, further comprising providing a component having resonance frequencies and using at least one of the resonance frequencies as the measurable quantity for producing or processing a micro-mechanical component.

42. (New) The method of Claim 35, wherein a resonance amplitude at a defined oscillation frequency serves as the measurable quantity for producing or processing a micro-mechanical component.

43. (New) The method of Claim 35, further comprising evaluating a hydrophobicity or a hydrophilicity of a processing surface as the measurable quantity.

44. (New) The method of Claim 35, further comprising evaluating an anisotropy of a processed material as the measurable quantity.

45. (New) The method of Claim 35, further comprising using a material selectivity of an interaction with composite materials as the measurable quantity in the processing of composite materials.

46. (New) The method of Claim 35, further comprising using at least one electrical property of said microelectronic component as the measurable quantity in processing a microelectronic component.

47. (New) The method of Claim 46, further comprising selecting said electrical property from the group consisting of: conductivity and capacitance.

48. (New) The method of Claim 35, further comprising using at least one plasma parameter as the measurable quantity in the treatment of human eye tissue.

49. (New) The method of Claim 48, further comprising selecting the plasma parameter from the group consisting of: an energy threshold value for an optical breakthrough, a scattered light, a plasma spectrum, and any combinations thereof.

50. (New) The method of Claim 35, wherein, in two-photon polymerization of photosensitive materials, the measurable quantities are selected from the group consisting of: a quantum efficiency of the polymerization process, optical properties of the polymerized materials, mechanical properties of the polymerized material, and any combinations thereof.

51. (New) The method of Claim 30, further comprising testing spectral parameters of the laser pulses for their effect on an intended processing operation and setting spectral parameters selected with regard to an intended processing effect as starting parameters for the material processing process.

52. (New) The method of Claim 30, further comprising setting spectral parameters of the laser pulses known from experiences or calculations as starting parameters for the processing process.

53. (New) An apparatus for carrying out the method as claimed in Claim 30, comprising:

a laser for generating laser pulses having a large spectral bandwidth;  
a processing unit connected to the user for laser pulse processing of an object to be processed, wherein the laser is operably connected to the processing unit with a pulse shaper for setting or modifying at least one of an amplitude, a spectral phase, or a spectral polarization of the laser pulses.

54. (New) The apparatus of Claim 53, further comprising at least one amplification stage arranged preceding or following the pulse shaper for amplification of the laser pulses.

55. (New) The apparatus of Claim 53, further comprising a measurement unit for monitoring the processing process, the measurement unit being operably connected to the pulse shaper with a control unit.

56. (New) The apparatus of Claim 55, wherein the measurement unit comprises at least one optical material property measurement unit for measuring the optical material properties.

57. (New) The apparatus of claim 55, wherein the optical material properties are selected from the group consisting of: a scattering, a refractive index spectrum, or a plasma emission spectrum, and any combinations thereof.

58. (New) The apparatus of Claim 55, wherein the measurement unit comprises at least one sensor for measurement of the temperature of material processing.

59. (New) The apparatus of Claim 55, wherein the measurement unit comprises at least one sensor for measurement of a surface roughness of an object to be processed.

60. (New) The apparatus of Claim 55, wherein the measurement unit comprises at least one optical sensor.

62. (New) The apparatus of Claim 53, wherein the apparatus is suitable for processing human eye tissue.

63. (New) The apparatus of Claim 53, further comprising a spectral phase modulator based on the use of a microelectromechanical system (MEMS).